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## XXXIV.—*On the Habits of the* Prisopi.

By Andrew Murray, F.L.S.

The few entomologists who have studied the Phasmidæ ("leaf-insects" and "walking-sticks") are familiar with the remarkable form and organization of the *Prisopi*; but, although that genus has occupied the attention of such acute entomologists as Stoll, Burmeister, and Blanchard, and more recently been monographed and its structure figured by that prince of entomological draughtsmen, Westwood, no suggestion has ever been made or explanation offered of the purpose and meaning of their singular organization.

It is not long since I obtained satisfactory information on this point from my friend Mr. Alexander Fry; and as he is too much occupied at present to publish it himself, and I think it too interesting to be kept back, I, with his permission, send you this account of what he knows on the subject.

It only relates to the species named *Prisopus flabelliformis*, a specimen of which he had obtained while in Brazil; but as all the species are characterized by the same peculiarities of structure, the habits of one will doubtless be the habits of all.

I may premise that Mr. Fry has the fullest confidence in the veracity of the person from whom he received the information, who moreover had no temptation to deceive him, and was, besides, too little acquainted with entomology to know that he was solving an entomological puzzle. The habits which he ascribes to the *Prisopus*, too, are not such as would readily occur to a romancer to endow a flying insect with, although, as it turns out, the structure is so admirably adapted to the purpose explained by him that it seems a wonder that the very perfection of its adaptation did not suggest to entomologists what the purpose was.

According to this observer, then, the insect was obtained by

him in the mountains of Brazil; and its habits were to spend the whole of the day under water, in a stream or rivulet, fixed firmly to a stone in the rapid part of the stream, but on the approach of dusk to leave the water and to sally forth into the night air on its own affairs, one of which undoubtedly would be to search for its lady love, whom it is reasonable to suppose we already know under some other form and described under some other name—judging, at least, from other Phasmidæ or leaf-insects, the perfect male of which has usually ample wings, while the female is not so well provided with organs for flight.

The creature is a large orthopterous insect, with wings of unusual dimensions and, the under ones especially, of fine membranous texture, apparently by no means well adapted for an aquatic life. And yet we shall presently see they are so arranged that they can be folded up exactly like a well-cared-for umbrella, placed under the protection of a waterproof cover.

Before passing the structure of the little creature under review and pointing out how thoroughly each part of it is fitted to the unusual mode of life ascribed to it, we may first pave the way by reminding the reader that this is not the only winged insect which has been ascertained to pass a great part of its life under water. Stoll figured a singular species, which Westwood* thinks belongs to the family of grasshoppers (Gryllidæ), under the name of the "Grillon aquatique cornu" (*Henicus Stollii* of G. R. Gray); but Westwood adds that "it is quite evident, from the saltatorial structure of the legs and the impossibility of the insect executing a leap under water (from the natural resistance of the element), that there must be a mistake in the statement that it is aquatic in its habits."

If I might hazard a conjecture on the subject, it would be that Stoll, who also describes our *Prisopus*, had received a true account of its habits, but had confounded it with the "aquatic cricket," and transferred the story from the one insect to the other. This is the less unlikely since we know that he had both in his cabinet.

More recently Mr. Lubbock described to the Linnean Society two aquatic Hymenoptera of small size, which he had observed in a basin of pond-water. "Though most of the great orders," says he, "are more or less richly represented (in water), no aquatic species of Hymenoptera or Orthoptera had till now been discovered. . . . . Great, therefore, was my astonishment, on the occasion to which I allude, when I saw in the water a small Hymenopterous insect, evidently quite at its ease, and actually

* J. O. Westwood, Modern Classification of Insects, i. p. 456.

*swimming* by means of its wings. At first I could hardly believe my eyes; but having found several specimens, and shown them to some of my friends, there can be no doubt about the fact"*.

For an account of the structure and economy of this wonderful creature, as well as of another similar species found at the same time, which, although living under water, does not use its wings, but its legs, for swimming, I must refer the reader to Mr. Lubbock's paper. I shall only observe that, although the wings in both are largely ciliated or fringed with hair, they are not more so than the wings of their terrestrial allies. As Mr. Lubbock says, "There is nothing in their structure to suggest the idea that they are aquatic."

Not so with our species when it is fairly examined with reference to its supposed habits and means of carrying them out.

The whole underside, even the head, is hollowed out like the half of a reed. The surface of that side is flexible, smooth, and finely polished. The margins are thinned off, and the segments of the abdomen, where not fitted to the posterior legs, are provided with flaps or quasi claspers. All the legs fit most beautifully and closely to the side of the abdomen. Their outer margin is dentate and provided with a thick fringe of hair, which, like the feathers of a duck, repels water. Moreover at the knee-joint, where there is unavoidably an opening or unprotected space, it is provided with a flap or side knee-pan—a provision which occurs in no other insect with which I am acquainted. This flap hangs down, filling up the opening, and is furnished, like the rest of the outer margins of the leg and body, with a supply of hair impervious to water. The posture of the animal in the water is, fastened to the upper surface of a stone, and with its head turned up stream in opposition to the current. It sits with its fore legs extended forwards in front of the head, and the inner side of the thighs is hollowed out exactly to fit the sides of the head, and the thigh itself is bent down so as to form the continuation of the sides of the long cup or saucer which the underside of the animal represents. The antennæ fold back on the upperside of the head, where there is a depression to receive them. In the other Phasmidæ the tegmina or upper wing-cases are usually short, narrow, and coriaceous, and apparently not fitted for much use. Here they are as long as the body, so as to cover the whole of the large under wings when folded up; they are broad enough to do so; and the whole are only of a semicoriaceous texture, flexible and pergaminous, but most so at the base, thinning away at the termination into a

* Trans. Linn. Soc. xxiv. p. 135.

finer texture, approaching that of the lower wings. The claws of the tarsi are strong, powerful, and well adapted for clinging.

In this animal we seem to have a combination of two plans of adhesion: there are the claws and claspers and flaps for holding on by; there is the hollow underside for adhering by exhausting the air between it and the stone it clings to, on the principle of the air-pump. If, when it settles on the stone and adjusts itself, its tracheæ are full of air, and it then expels the air and by muscular power draws in the skin of the abdomen and underside generally, it must, of course, leave a vacuum, and consequently adhere like a sucker.

This species from the mountains of Brazil is the only one of whose aquatic habits any account has been received; but the genus, although individuals are rare (as with most species which only show themselves at night), is widely distributed.

The following are the species known up to the present time, with their localities, taken from Westwood's recent Monograph of the Phasmidæ:—

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| *Prisopus flabelliformis*, Stoll. | Brazil; Cayenne. |
| —— *spiniceps*, Burm. | Do. do. |
| —— *Ohrtmanni*, Licht. | East Indies. |
| —— *horridus*, Westw. | Columbia. |
| —— *Horstokkii*, De Haan. | Cape of Good Hope. |
| —— *berosus*, Westw. | Panama. |
| —— *phacellus*, Westw. | Brazil; Ega. |
| —— *incertus*, Westw. | Samarang; Java. |
| —— *cornutus*, G. R. Gray. | India. |
| —— *cepus*, Westw. | Bolivia. |
| —— *Guerini*, Westw. | Ile Maurice. |

Now that their habits are made known, we may expect that specimens will become less rare, and that we shall receive more information regarding their economy and mode of life.

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XXXV.—*On Two European* Argulidæ, *with Remarks on the Morphology of the* Argulidæ *and their Systematic Position, together with a Review of the Species of the Family at present known.* By T. Thorell.

[Continued from p. 169.]

## III.

As the question of the position which the family Argulidæ should occupy in the system of the Crustacea is far from having received a satisfactory solution, it will not be out of place here to dwell somewhat further on this subject. Referred by Linné